Pinpoint Tests

PINPOINT TEST A: FUEL LEVEL READS INACCURATELY

A1 VERIFY POWER AT FUSE 11 — LOAD SIDE

- Key ON.
- Using Rotunda Digital Volt-Ohmmeter 014-00407 or equivalent, verify system voltage at the load side of fuse 11.
- **Is the voltage greater than 10 volts?**

→ **Yes**
GO to **A3** .

→ **No**
GO to **A2** .

A2 VERIFY POWER AT FUSE 11 — FEED SIDE

- Key ON.
- Using Rotunda Digital Volt-Ohmmeter 014-00407 or equivalent, verify system voltage at the feed side of the fuse 11.
- **Is the voltage greater than 10 volts?**

→ **Yes**
REPLACE the fuse. RETEST system.

→ **No**
REPAIR the wiring to the fuse panel. RETEST system.

A3 VERIFY POWER AT CLUSTER CIRCUIT 640 (R/Y)

- Have cluster connector(s) remain intact.
- Partially remove the instrument cluster from the instrument panel .
- Key ON.
- Measure the voltage on Circuit 640 (R/Y) at the instrument cluster connector to ground.
- **Is the voltage greater than 10 volts?**

→ **Yes**
GO to **A4** .

→ **No**
REPAIR Circuit 640 (R/Y). RETEST system.

A4 VERIFY GROUND CIRCUIT 570 (BK/W)

CAUTION: Before checking the continuity of any circuit, make sure there is no voltage present in the circuit prior to switching the test equipment to the resistance function to avoid damage to equipment. Refer to the test equipment user's manual for additional information.

- Use an ohmmeter to check the continuity of the ground wire at the instrument cluster connector to ground.
- **Is the resistance less than 1 ohm?**

→ **Yes**
GO to **A5** .

→ **No**
REPAIR Circuit 570 (BK/W). RETEST system.

A5 CHECK FUEL GAUGE (EMPTY)

- Key OFF.
- Disconnect the fuel gauge sending unit.
- Connect one lead of the Rotunda Instrument Gauge System Tester 021-00055 or equivalent to the fuel sending unit input wire Circuit 29 (Y/W) at the fuel gauge sending unit connector. Connect the other lead to ground.
- Set the tester to 22 ohms.
- Key ON.
- Wait one minute.
- Read the fuel gauge.
- **Does the fuel gauge read E (empty)?**

→ **Yes**
GO to **A9** .

→ **No**
GO to **A6** .

A6 RECHECK FUEL GAUGE (EMPTY)

- Place the key in the OFF position. Then to the ON position. Tap on the instrument panel .
- Wait one minute.
- Read the fuel gauge.
- **Does the fuel gauge read E (empty)?**

→ **Yes**
GO to **A9** .

→ **No**
GO to **A7** .

A7 CHECK PRINTED CIRCUIT BOARD

- Key OFF.
- Disconnect the instrument cluster and instrument cluster gauge amplifier .
- Measure the resistance of the circuit between the "SIG" terminal of the fuel gauge and the instrument cluster gauge amplifier .
- **Is the resistance less than 1 ohm?**

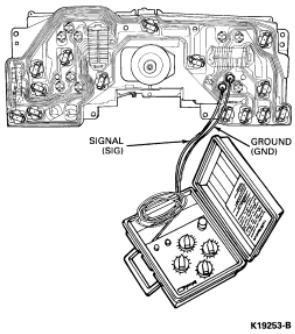
→ **Yes**
GO to **A8** .

→ **No**
Ranger and Explorer: REPLACE instrument cluster printed circuit as described in Removal and Installation, Instrument Cluster in this section.

Aerostar: REPLACE instrument cluster as described in Removal and Installation, Instrument Cluster in this section.

A8 CHECK INSTRUMENT CLUSTER GAUGE AMPLIFIER (EMPTY)

- Turn the key to OFF position. Remove the instrument cluster. Inspect the instrument cluster printed circuit .
- Remove the instrument cluster gauge amplifier . Connect a jumper wire from the Rotunda Instrument Gauge System Tester 021-00055 or equivalent directly to the fuel gauge "SIG" terminal.
- Install the instrument cluster.
- Turn the key to the ON position.
- Read the fuel gauge.
- **Does the fuel gauge read E (empty)?**



→ **Yes**
REPLACE the Instrument Cluster Gauge Amplifier as described in Removal and Installation in this section. GO to **A5** .

→ **No**
REPLACE the fuel gauge as described in Removal and Installation in this section. INSTALL the Instrument Cluster Gauge Amplifier as described in Removal and Installation in this section and RETURN to **A5** .

A9 CHECK FUEL GAUGE SENDING UNIT WIRE

- Key OFF.
- Disconnect the instrument cluster and the fuel gauge sending unit.
- Measure the resistance of Circuit 29 (Y/W) between the instrument cluster and the fuel gauge sending unit.
- **Is the resistance less than 1 ohm?**

→ **Yes**
GO to **A10** .

→ **No**
SERVICE Circuit 29 (Y/W) between the instrument cluster and the fuel gauge sending unit. RETEST system.

A10 CHECK FUEL SENDING UNIT GROUND

- Key OFF.
- Measure the resistance of Circuit 651 (BK/Y) (Ranger and Explorer) or "BK/W" (Aerostar) wire at the fuel gauge sending unit connector to ground at battery.
- **Is the resistance less than 1 ohm?**

→ **Yes**
GO to **A11** .

→ **No**
SERVICE Circuit 651 (BK/Y) (Ranger and Explorer) or "BK/W" (Aerostar) wire from the fuel gauge sending unit to ground.

A11 CHECK FUEL GAUGE (FULL)

- Key OFF.
- Disconnect the fuel gauge sending unit.
- Connect one lead of the Rotunda Instrument Gauge System Tester 021-00055 or equivalent to Circuit 29 (Y/W) at the fuel gauge sending unit connector and the other lead to ground.
- Set the tester to 145 ohms.
- Key ON.
- Wait one minute.
- Read the fuel gauge.
- **Does the fuel gauge read F (full)?**

→ **Yes**
GO to **A13** .

→ **No**
GO to **A12** .

A12 CHECK INSTRUMENT CLUSTER GAUGE AMPLIFIER (FULL)

- Turn the key to OFF position. Remove the instrument cluster. Inspect the instrument cluster printed circuit . Remove the instrument cluster gauge amplifier . Connect the jumper wire from the Rotunda Instrument Gauge System Tester 021-00055 or equivalent directly to the fuel gauge "SIG" terminal.
- Install the instrument cluster.
- Turn the key to the ON position.
- Read the fuel gauge.
- **Does the fuel gauge read F (full)?**

→ **Yes**
REPLACE the Instrument Cluster Gauge Amplifier as described in Removal and Installation in this section. GO to **A5** .

→ **No**
REPLACE the fuel gauge as described in Removal and Installation in this section. RETURN to**A5** .

A13 FUEL TANK INSPECTION

- Inspect fuel tank for distortion or damage.
- **Is fuel tank damaged?**

→ **Yes**
REPLACE fuel tank . REFER to Section 10-01.

→ **No**
GO to **A14** .

A14 TEST BOX CHECK — EMPTY STOP

- Connect one lead of a Rotunda Digital Volt-Ohmmeter 014-00407 or equivalent, to the fuel sender signal lead Circuit 29 (Y/W) and the other lead to sender ground Circuit 651 (BK/Y).
- When the float rod is against the empty stop (closest to fuel filter).
- **Does DVOM read 14-18 ohms?**

→ **Yes**
GO to **A15** .

→ **No**
REPLACE fuel sender.

A15 TEST BOX CHECK — FULL STOP

- Connect one lead of a Rotunda Digital Volt-Ohmmeter 014-00407 or equivalent, to the fuel sender signal lead Circuit 29 (Y/W) and the other lead to sender ground Circuit 651 (BK/Y).
- When the float rod is against the full stop.
- **Does DVOM read 154-162 ohms?**

→ **Yes**
GO to **A16** .

→ **No, less than 154 or greater than 162 ohms**
REPLACE fuel sender.

A16 TEST BOX CHECK — FLOAT ROD TRAVEL

- Connect one lead of a Rotunda Digital Volt-Ohmmeter 014-00407 or equivalent, to the fuel sender signal lead Circuit 29 (Y/W) and the other lead to sender ground Circuit 651

(BK/Y).

- Move float rod slowly from FULL to EMPTY stop position.
- **Does ohmmeter reading decrease slowly?**

→ **Yes**
GO to **A17** .

→ **No**
REPLACE fuel sender. REFER to Section 10-01.

A17 HARNESS CONNECTOR CHECK — EMPTY STOP

- Reattach all fuel indication connectors.
- Move float rod to empty stop position.
- Place key in the ON position.
- Wait 60 seconds.
- Read fuel gauge.
- **Does fuel gauge read empty?**

→ **Yes**
GO to **A18** .

→ **No**
GO to **A7** .

A18 HARNESS CONNECTOR CHECK — FULL STOP

- Reattach all fuel indication connectors.
- Move float rod to full-stop position.
- Place key in the ON position.
- Wait 60 seconds.
- Read fuel gauge.
- **Does fuel gauge read full?**

→ **Yes**
GO to **A19** .

→ **No**
GO to **A7** .

A19 INSPECT FUEL SENDER

- Inspect float and float rod.
- **Is float rod distorted, hitting filter, filled with fuel or loose on float rod?**

→ **Yes**
REPLACE fuel sender. REFER to Section 10-01.

→ **No**
GO to **A20** .

A20 PIGTAIL HARNESS CHECK — EXPLORER

- Connect one lead of a Rotunda Digital Volt-Ohmmeter 014-00407 or equivalent, to the fuel sender signal lead Circuit 29 (Y/W) in the pigtail connector and the other lead to the corresponding below the flange rivet.
- Check sending unit ground Circuit 651 (BK/Y) in same manner as above.
- **Is ohmmeter reading greater than 1 ohm?**

→ **Yes**
REPLACE fuel sending unit. REFER to Section 10-01.

→ **No**
Pigtail OK.

PINPOINT TEST B: COOLANT TEMPERATURE READS INACCURATELY

B1 VERIFY POWER AT FUSE PANEL — LOAD SIDE

- Using Rotunda Digital Volt-Ohmmeter 014-00407 or equivalent verify system voltage at load side of warning indicator fuse 11.
- **Is system voltage present at load side of fuse?**

→ **Yes**
GO to **B3** .

→ **No**
GO to **B2** .

B2 VERIFY POWER AT FUSE PANEL — FEED SIDE

- Using Rotunda Digital Volt-Ohmmeter 014-00407 or equivalent verify system voltage at feed side of warning indicator fuse 11.
- **Is system voltage present at feed side of fuse?**

→ **Yes**
REPLACE fuse. RETEST system.

→ **No**
SERVICE wiring to fuse panel. RETEST system.

B3 VERIFY POWER AT INSTRUMENT CLUSTER

- Partially remove cluster from instrument panel . Using Rotunda Digital Volt-Ohmmeter 014-00407 or equivalent verify system voltage at cluster connector Circuit 640 (R/Y) or gauge terminal.
- Inspect cluster connector for damage.
- **Is voltage present at cluster connector and gauge terminal?**

→ **Yes**
GO to **B4** .

→ **No**
SERVICE Circuit 640 (R/Y). RETEST system.

B4 VERIFY GROUND CIRCUITRY AT CLUSTER

CAUTION: Before checking the continuity of any circuit, make sure there is no voltage present in the circuit prior to switching the test equipment to the resistance function to avoid damage to equipment. Refer to the test equipment user's manual for additional information.

- Using Rotunda Digital Volt-Ohmmeter 014-00407 or equivalent, check continuity of cluster and gauge ground Circuit 570 (BK/W).
- **Is the resistance less than 1 ohm?**

→ **Yes**
GO to **B5** .

→ **No**
SERVICE Circuit 570 (BK/W). RETEST system.

B5 TEST SENDER CIRCUIT AT COLD

- Insert Rotunda Instrument Gauge System Tester 021-00055 or equivalent. Disconnect connector at sender and connect tester to cluster side of connector, Circuit 39 (R/W). Set to 74 ohms.

- **Does gauge read C?**

→ **Yes**
GO to **B6** .

→ **No**
GO to **B7** .

B6 TEST SENDER CIRCUIT AT HOT

- Set Gauge System Tester to 9.7 ohms.
- **Does gauge read H?**

→ **Yes**
REPLACE coolant temperature sender. REFER to Section 03-03.

→ **No**
GO to **B7** .

B7 CHECK SENDING UNIT CIRCUIT WIRING

CAUTION: Before checking the continuity of any circuit, make sure there is no voltage present in the circuit prior to switching the test equipment and to the resistance function to avoid damage to equipment. Refer to the test equipment user's manual for additional information.

- Using Rotunda Digital Volt-Ohmmeter 014-00407 or equivalent, check sending unit circuit wiring and instrument cluster printed circuit for shorts or opens by physically flexing the wiring and observing continuity. The continuity reading should not fluctuate.
- **Are wiring and flex circuit OK?**

→ **Yes**
REPLACE gauge as described in Removal and Installation in this section.

→ **No**
Aerostar: SERVICE wiring or REPLACE the Instrument Cluster as described in Removal and Installation in this section.

Ranger/Explorer: SERVICE wiring or replace Instrument Cluster Printed Circuit as described in Removal and Installation this section.

PINPOINT TEST C: OIL PRESSURE READS INACCURATELY

C1 VERIFY POWER AT FUSE PANEL — LOAD SIDE

- Using Rotunda Digital Volt-Ohmmeter 014-00407 or equivalent, verify system voltage at load side of warning indicator fuse 11.
- **Is system voltage present at load side of fuse?**

→ **Yes**
GO to **C3** .

→ **No**
GO to **C2** .

C2 VERIFY POWER AT FUSE PANEL — FEED SIDE

- Using Rotunda Digital Volt-Ohmmeter 014-00407 or equivalent, verify system voltage at feed side of warning indicator fuse 11.
- **Is system voltage present at feed side of fuse?**

→ **Yes**
REPLACE fuse. RETEST system.

→ **No**
SERVICE wiring to fuse panel. RETEST system.

C3 VERIFY POWER AT CLUSTER

- Partially remove cluster from IP. Using Rotunda Digital Volt-Ohmmeter 014-00407 or equivalent, verify system voltage at cluster connector CIrcuit 640 (R/Y) and/or gauge terminal.

- Inspect cluster connector for damage.
- **Is voltage present at cluster connector and gauge terminal?**

→ **Yes**
GO to **C4** .

→ **No**
SERVICE Circuit 640 (R/Y). RETEST system.

C4 VERIFY GROUND CIRCUITRY AT CLUSTER

CAUTION: Before checking the continuity of any circuit, make sure there is no voltage present in the circuit prior to switching the test equipment to the resistance function to avoid damage to equipment. Refer to the test equipment user's manual for additional information.

- Using Rotunda Digital Volt-Ohmmeter 014-00407 or equivalent, check continuity of instrument cluster Circuit 570 (BK/W) and gauge ground circuitry.
- **Is ground circuitry good?**

→ **Yes**
GO to **C5** .

→ **No**
SERVICE as required.

C5 TEST SENDER CIRCUIT AT LOW

- Place key in the ON position with engine off. Observe gauge performance.
- **Does the gauge read L or below?**

→ **Yes**
GO to **C6** .

→ **No**
GO to **C7** .

C6 CHECK GAUGE RESPONSE

- Disconnect oil pressure switch and short the lead to engine ground.
- **Does the gauge indicate approximately mid-scale or slightly above mid-scale (around the MAL in NORMAL)?**

→ **Yes**
REPLACE oil pressure switch. REFER to Section 03-01A, Section 03-01B or Section 03-01C.

→ **No**
GO to **C7** .

C7 CHECK SENDING UNIT/SWITCH WIRING

CAUTION: Before checking the continuity of any circuit, make sure there is no voltage present in the circuit prior to switching the test equipment to the resistance function to avoid damage to equipment. Refer to the test equipment user's manual for additional information.

- Using Rotunda Digital Volt-Ohmmeter 014-00407 or equivalent, check sending unit/switch wiring and instrument cluster printed circuit for shorts or opens by physically flexing the wiring and observing continuity. The continuity reading should not fluctuate.
- Gauge will read beyond the normal band if not grounded.
- **Is wiring and instrument cluster printed circuit OK?**

→ **Yes**
REPLACE gauge as described in Removal and Installation in this section.

→ **No**
Aerostar: SERVICE wiring or REPLACE the Instrument Cluster. Ranger/Explorer: SERVICE wiring or REPLACE Instrument Cluster Printed Circuit as described in Removal and Installation in this section.

PINPOINT TEST D: CHARGE INDICATOR READS INACCURATELY

D1 VERIFY VOLTAGE GAUGE OPERATION

- Key ON (with engine stopped).
- Headlamps ON.
- Heater blower/fan on HIGH.
- **Does gauge pointer move toward the lower portion of the NORMAL BAND (white marked area)?**

→ **Yes**
GO to D2 .

→ **No**
CHECK fuse 11 and the battery-to-circuit breaker and Circuit 640 (R/Y). GO to D6 .

D2 VERIFY POWER AT FUSE PANEL — LOAD SIDE

- Using Rotunda Digital Volt-Ohmmeter 014-00407 or equivalent, verify system voltage at load side of warning indicator fuse 11.
- **Is system voltage present at load side of fuse?**

→ **Yes**
GO to D4 .

→ **No**
GO to D3 .

D3 VERIFY POWER AT FUSE PANEL — FEED SIDE

- Using Rotunda Digital Volt-Ohmmeter 014-00407 or equivalent, verify system voltage at feed side of warning indicator fuse 11.
- **Is system voltage present at feed side of fuse?**

→ **Yes**
REPLACE fuse. RETEST system.

→ **No**
SERVICE wiring to fuse panel. RETEST system.

D4 VERIFY POWER AT INSTRUMENT CLUSTER

- Partially remove instrument cluster from instrument panel . Using Rotunda Digital Volt-Ohmmeter 014-00407 or equivalent, verify system voltage at cluster connector Circuit 640 (R/Y) or gauge terminal.
- **Is voltage present at instrument cluster connector and gauge terminal?**

→ **Yes**
GO to D5 .

→ **No**
SERVICE Circuit 640 (R/Y).

D5 VERIFY GROUND CIRCUITRY AT INSTRUMENT CLUSTER

CAUTION: Before checking the continuity of any circuit, make sure there is no voltage present in the circuit prior to switching the test equipment to the resistance function to avoid damage to equipment.

Refer to the test equipment user's manual for additional information.

- Using Rotunda Digital Volt-Ohmmeter 014-00407 or equivalent, check continuity of instrument cluster Circuit 570 (BK/W) and gauge ground circuitry.
- **Is ground circuitry good?**

→ **Yes**
GO to D6 .

→ **No**
SERVICE Circuit 570 (BK/W).

D6 CHECK INSTRUMENT CLUSTER PRINTED CIRCUIT CONTINUITY

CAUTION: Before checking the continuity of any circuit, make sure there is no voltage present in the circuit prior to switching the test equipment to the resistance function to avoid damage to equipment. Refer to the test equipment user's manual for additional information.

- Check for instrument cluster printed circuit continuity and confirm flex circuit-to-clip and clip-to-gauge contact by physically flexing the wiring and observing continuity. Continuity reading should not fluctuate.
- **Are wiring and instrument cluster printed circuit OK?**

→ **Yes**
REPLACE gauge as described in Removal and Installation in this section.

→ **No**
Aerostar: SERVICE wiring or REPLACE the Instrument Cluster as described in Removal and Installation in this section.
Ranger/Explorer: SERVICE wiring or REPLACE Instrument Cluster Printed Circuit as described in Removal and Installation in this section.

PINPOINT TEST E: SPEEDOMETER/ODOMETER READS INACCURATELY, AEROSTAR

E1 CHECK INITIAL STATUS

- Refer to speedometer calibration tolerance specifications table in E7 . Be sure to check the odometer calibration. If both the odometer and speedometer are incorrect in the same direction, it is usually a sign that the conversion constant, tire size, or speed sensor ring are different than programmed. A speedometer inaccurate with an accurate odometer is usually a problem with the speedometer module itself.
- **Are speedometer and odometer calibration within specified limits?**

→ **Yes**
Speedometer normal.

→ **No**
GO to **E2** .

E2 CHECK FOR "NOT PROGRAMMED" MESSAGE

- **Does "ERROR 3" message alternate with normal odometer display?**

→ **Yes**
GO to **E7** . RESET conversion constant. REFER to Reset Conversion Constant in **E7** .

→ **No**
GO to **E3** .

E3 CHECK TIRES/AXLE CAPACITY

- **Are tires the same size on opposite ends of a common axle and properly inflated?**

→ **Yes**
DETERMINE conversion constant. GO to **E5** .

→ **No**
CORRECT condition or ADVISE customer. GO to **E1** .

E4 VERIFY CONVERSION CONSTANT AND DISPLAY MODE

- Check whether the conversion constant in the speedometer is correct with the following procedure: Press and hold the RESET button on the front of the speedometer while turning the key to RUN.Release the RESET button. The pointer will prove out and some codes will appear on the odometer display. If an "E" is on the left side of the display, the module is programmed for English display mode and should have English (MPH) graphics. A lower case "o" signifies an overseas (KMH) graphics. Verify the graphics and display modes agree. (The number appearing after the type is the microprocessor revision level and is not used in this test.)Press and release the RESET button again. The conversion constant and the word CAL will be shown on the odometer display.Verify the programmed conversion constant is the same as that displayed on the chart or the constant calculated in E6. Refer to Conversion Constants Chart under Specifications in this section.Turn off the key to exit this test.
- **Is the programmed conversion constant the same as that displayed on the chart or the constant calculated in E6?**

→ **Yes**
REPLACE Instrument Cluster as described in this section. VERIFY proper operation.

→ **No**

GO to E7 .

E5 DETERMINE CONVERSION CONSTANT

- Check tire size and type on vehicle rear axle or SAE average revs/mile. Refer to Tire/Axle Capacity Chart and note conversion constant.
- **Can the conversion constant be determined?**

→ **Yes**
VERIFY conversion constant. GO to E4 .

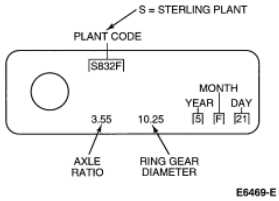
→ **No**
GO to E6 .

E6 MEASURE TIRE DIAMETER

- To determine the conversion constant perform the following procedure: Hoist vehicle.Measure tire outside diameter (TOD).Note number of rear axle speed sensor teeth, speed sensor ring diameter, or axle capacity/tape group.Verify speed sensor ring diameter with identification tag attached to rear axle cover retaining bolts. If tag is missing manually count teeth.

  NOTE: 7.5-inch rear axles have 102 teeth and 8.8-inch rear axles have 108 teeth.

- **Is outside diameter greater than 25.2 inches?**



→ **Yes**
USE formula revs/mile = 1528 - (28x TOD) to calculate SAE average revs/mile. GO to E4 .

→ **No**
Revs/mile = 20,850/TOD. GO to E4 .

E7 RESET CONVERSION CONSTANT

- Reprogram speed conversion constant using the following procedure: Locate the dealer mode programming enable connection. It is located behind the cowl side trim panel .Insert metal clip in service wire panel connector. Clip other end to vehicle ground while the key is in the OFF position.Turn key to RUN (not crank) position while holding down the trip odometer RESET button on speedometer . Release RESET button.Speedometer will prove out (sweep across dial and back). The English/Metric and revision levels will be displayed.
  The last number on the right side of display is the reprogramming lockout count. This count shows the number of allowable conversion constants remaining. When the count is zero, no additional changes can be made to this instrument cluster . If a conversion constant change is necessary, a service instrument cluster must be ordered.
  Press and release RESET button again and PSOM conversion constant (without the decimal point) followed by the word CAL.Press and release the odometer SELECT button as many times as necessary to change conversion constant to the correct value.

  NOTE: Pressing and releasing the RESET button to lock in the new conversion constant removes the number of times the PSOM can be reprogrammed by one count. The module can only be reprogrammed six times. If it is determined the original conversion constant is satisfactory, turn the key to OFF BEFORE the new constant is locked in.

  When the correct new value is displayed in odometer window, press and release the RESET button to lock in the new conversion constant.Turn the key off and remove the ground wire. Verify proper operation of the speedometer .

- **Is conversion constant set to desired value?**

Actual Speedometer or Odometer Value Indicated	48 km/h (30 mph) Actual Speed	97 km/h (60 mph) Actual Speed	Odometer Measure Over Actual 16.1 km Distance (10 Miles)
Allowable Range	45-55 km/h (28-34 mph)	93-108 km/h (58-67 mph)	15.4-16.6 km (9.6-10.3 miles)

→ **Yes**
Procedure complete.

→ **No**
GO to E5 .

PINPOINT TEST F: SPEEDOMETER/ODOMETER READS INACCURATELY, RANGER AND EXPLORER

F1 CHECK CONNECTIONS

- Verify connector is properly attached at speed sensor.
- **Are all connections good?**

→ **Yes**
GO to **F2** .

→ **No**
REPAIR or REPLACE as necessary. RETEST system.

F2 CHECK ODOMETER

- Check accuracy of odometer.
- If odometer is accurate, calibration of speedometer may be off. Changing the speedometer may correct, but going on to change either gear will make speedometer reading more accurate, but now odometer will not be accurate.
- **Is odometer accurate?**

→ **Yes**
REPLACE Speedometer as described in Removal and Installation in this section. CHECK for speedometer accuracy.

→ **No**
GO to **F3** .

F3 CHECK DRIVEN GEAR

- Check for proper driven gear. Refer to the Ford Speedometer Gear Supplement Charts for speedometer gear applications.
- If odometer is accurate, calibration of speedometer may be off. Changing the speedometer may correct but going on to change either gear will make speedometer reading more accurate, but now odometer will not be accurate.
- **Is the correct driven gear installed?**

→ **Yes**
GO to **F4** .

→ **No**
REPLACE gear with correct gear. CHECK for accuracy.

F4 CHECK DRIVE GEAR AXLE, TIRES AND RATIO ADAPTOR

- Check for proper drive gear, axle, tires and ratio adaptor.
- **Is drive gear axle, tire and ratio adapter correct?**

→ **Yes**
REPLACE Speedometer as described in Removal and Installation in this section. CHECK for accuracy.

→ **No**
REPLACE incorrect component or driven gear. CHECK for accuracy.

PINPOINT TEST G: SPEEDOMETER/ODOMETER INOPERATIVE (PSOM), AEROSTAR

G1 CHECK REAR ANTI-LOCK LAMP ILLUMINATION

- Key to RUN.
- **Does anti-lock lamp on dash go out after self-test?**

→ **Yes**
GO to **G2** (display).

→ **No**
REFER to Section 06-09A for diagnosis of anti-lock speed sensor, and speed sensor gear.

G2 CHECK ODOMETER DISPLAY

- **Is odometer display on, and do digits appear normal?**

→ **Yes**
GO to **G3** .

→ **No**
GO to **G6** .

G3 CHECK FOR PRESENCE OF ERROR MESSAGE

NOTE: "ERROR 3" indicates the conversion constant must be programmed. See Pinpoint Test E .

- **Does the word "ERROR" appear on the odometer display?**

→ **Yes**
REPLACE Instrument Cluster as described in Removal and Installation in this section. VERIFY proper operation.

→ **No**
GO to **G4** .

G4 CHECK ODOMETER OPERATION

- **Odometer display increments mileage with vehicle motion or rear wheels turning?**

→ **Yes**
GO to **G9** .

→ **No**
GO to **G5** .

G5 CHECK SPEEDOMETER

- Does
  speedometer indication increase with increasing vehicle speed?

→ **Yes**
REPLACE Instrument Cluster as described in Removal and Installation in this section. VERIFY proper operation.

→ **No**
GO to **G8** .

G6 CHECK SPEEDOMETER POWER FUSES

- Remove, check, and reinstall battery power fuse No. 8 if intact.
- Remove, check, and reinstall battery power fuse No. 17 if intact.

  NOTE: If fuses are blown, replace with a new, intact fuse. If new fuse blows, determine cause and service as necessary.
- **With fuses intact, do the speedometer and odometer operate properly?**

→ **Yes**
REPLACE Instrument Cluster as described in Removal and Installation in this section. VERIFY proper operation.

→ **No**
Go to **G7** .

G7 CHECK SPEEDOMETER CONNECTOR VOLTAGES

- Verify battery, ground and ignition available on Pins 1, 2 and 3 respectively with key in RUN.

  NOTE: Only the wiring harness end of the connector should be probed.

- **Is resistance to ground less than 1 ohm with terminals in wiring harness connector completely seated in connector and locking tabs?**

→ **Yes**
REPLACE Instrument Cluster as described in Removal and Installation in this section.

→ **No**
SERVICE wiring harness and fuses as required. VERIFY proper operation.

G8 CHECK SPEED INPUT SIGNAL

- Connect Rotunda Digital Volt-Ohmmeter 014-00407 or equivalent to Pin 4 (speed in +) and Pin 5 (speed in -).

  NOTE: Only the wiring harness end of the connector should be probed.

- **Does the voltage increase smoothly and continuously from 0 to approximately 3.5 volts as vehicle speed increases from 0 to 30 mph?**

  OR,

- If available, a frequency counter may be connected to Pin 4 (speed in +) and Pin 5 (speed in -).

- **Does the displayed frequency of the signal increase smoothly and continuously from 0 to approximately 667 Hz at approximately 30 mph?**

  OR,

- If neither a voltmeter nor frequency counter is available, vehicle speed control may be used as a good indicator. If it works normally, then the speedometer module is at least receiving a speed input signal and the wiring and sensor can be assumed to be good.

- **Does the speed control work normally?**

→ **Yes**
REPLACE Instrument Cluster as described in Removal and Installation in this section.

→ **No**
SERVICE wiring. CHECK for open or shorted wiring. If no problems are found, REFER to Section 06-09A.

G9 CHECK SPEEDOMETER OPERATION

- **Does speedometer indication increase with increasing vehicle speed?**

→ **Yes**
Normal operation. ADVISE customer.

→ **No**
REPLACE Instrument Cluster as described in Removal and Installation in this section.

PINPOINT TEST H: SPEEDOMETER/ODOMETER INOPERATIVE, RANGER AND EXPLORER

H1 CHECK CONNECTIONS

- Verify connector is properly attached at speed sensor.

- **Are connections good and is drive tip seated properly?**

→ **Yes**
GO to **H2** .

→ **No**
SERVICE or REPLACE as necessary, RETEST system.

H2 CHECK ODOMETER/POINTER

- Check operation of odometer/pointer.

- **Does the odometer operate and the speedometer pointer not operate?**

→ **Yes**
GO to **H3** .

→ **No**
REPLACE Speedometer as described in Removal and Installation in this section. RECHECK speedometer for operation.

H3 CHECK SPEEDOMETER POINTER

- Check operation of speedometer pointer.
- **Does the speedometer/pointer operate?**

→ **Yes**
GO to **H4** .

→ **No**
REPLACE Speedometer as described in Removal and Installation in this section. RECHECK speedometer for operation.

H4 CHECK VEHICLE SPEED SENSOR

- Disconnect speedometer connector from vehicle speed sensor and remove vehicle speed sensor and check that shaft in vehicle speed sensor turns freely.
- **Does shaft turn freely?**

→ **Yes**
GO to **H5** .

→ **No**
REPLACE Vehicle Speed Sensor as described in Removal and Installation in this section. CHECK speedometer for operation.

H5 CHECK GEARS

- Check drive gear for damage or wear.
- **Is drive gear damaged?**

→ **Yes**
REPLACE damaged or worn gear. CHECK speedometer for operation.

→ **No**
System OK.

PINPOINT TEST J: SPEED CONTROL, PCM, OR ELECTRONIC TRANSMISSION INOPERATIVE OR ERRATIC

NOTE: Follow this procedure only after being referred here by the Speed Control, PCM or electronic transmission shop manual diagnostics.

J1 CHECK REAR ANTI-LOCK LAMP ILLUMINATION

- Key ON.
- **Does anti-lock lamp on dash go out after self-test?**

→ **Yes**
GO to **J2** .

→ **No**
REFER to Section 06-09A.

J2 CHECK SPEEDOMETER SPEED OUTPUT SIGNAL

CAUTION: Before checking the continuity of any circuit, make sure there is no voltage present in the circuit prior to switching the test equipment to the resistance function to avoid damage to equipment. Refer to the test equipment user's manual for additional information.

- Using Rotunda Digital Volt-Ohmmeter 014-00407 or equivalent, check for shorts in the wiring between Pin 7 (speed out) and battery/ignition or ground.
  Is circuit shorted?
- Use an ohmmeter to check for opens in the wiring between Pin 7 (speed out) and the affected module. Verify that terminals in PSOM wiring connector are completely seated in the connector.
  Is the circuit open?
- Connect an AC voltmeter to Pin 7 (speed out) and Pin 2 (module ground).
  Does the voltage increase smoothly and continuously from 0 to approximately 4.5 volts as vehicle speed increases from 0 to approximately 30 mph?

OR,

- If available, a frequency counter may be connected to Pin 7 (speed out) and Pin 2 (module ground).
  Does the displayed frequency of the signal increase smoothly and continuously from 0 to approximately 67 hz at approximately 35 mph?

  OR,

- If neither a voltmeter nor frequency counter is available, vehicle speed control may be used as a good indicator. If it works normally above 30 mph, this means that the speedometer module is at least receiving a speed input signal and the wiring and sensor can be assumed to be good.
  Does speed control work?

→ **Yes**
SERVICE wiring between speedometer and affected module as required. VERIFY proper operation.

→ **No**
GO to **J3** .

J3 CHECK SPEED INPUT SIGNAL

CAUTION: Make sure multimeter is in the voltage function and not in the resistance function to avoid damage to multimeter.

- Connect Rotunda Digital Volt-Ohmmeter 014-00407 or equivalent to Pin 4 (speed/in +) and Pin 5 (speed/in -).
  Does the voltage increase smoothly and continuously from 0 to approximately 3.5 volts as vehicle speed increases from 0 to approximately 30 mph?

  NOTE: Only the wiring harness end of the connector should be probed.

  OR,

- If available, a frequency counter may be connected to Pin 4 (speed in +) and Pin 5 (speed in -).
  Does the displayed frequency of the signal increase smoothly and continuously from 0 to approximately 667 hz at approximately 30 mph?

  NOTE: Only the wiring harness end of the connector should be probed.

→ **Yes**
REPLACE Instrument Cluster as described in Removal and Installation in this section.

→ **No**
SERVICE wiring. CHECK for opens or shorted wiring. If no problems are found, REFER to Section 06-09A or Section 06-09B.

PINPOINT TEST K: TACHOMETER INOPERATIVE, RANGER AND EXPLORER

K1 CHECK FUSE

- Check fuse 11.
- **Is fuse OK?**

→ **Yes**
GO to **K2** .

→ **No**
REPLACE fuse. If fuse blows again, CHECK for short in circuit.

K2 CHECK CIRCUIT 11 (T/Y) FOR VOLTAGE AT TACH TEST CONNECTOR

- Start engine.
- Measure voltage at tach test connector using 73 Digital Multimeter 105-R0051 or equivalent.
- **Is voltage between 0.3 and 0.6 volts (Explorer) or between 3 and 9 volts (Ranger)?**

→ **Yes**
GO to **K3** .

→ **No**
Refer to Powertrain Control/Emission Diagnosis Manual, Explorer (OBDI) or Ranger (OBDII).

K3 CHECK CIRCUIT 640 (R/Y) FOR VOLTAGE

- Key off.

- Disconnect battery ground cable.
- Remove instrument cluster.
- Disconnect instrument cluster connector C1.
- Connect battery ground cable.
- Key to RUN.
- Check for battery voltage at instrument cluster connector pin C1-4 using digital multimeter.
- **Is battery voltage present?**

→ **Yes**
GO to **K4** .

→ **No**
REPAIR Circuit 640 (R/Y). VERIFY tachometer operation.

K4 CHECK GROUND CIRCUIT RESISTANCE

- Key off.
- Measure resistance between instrument cluster connector Pin C1-1 and chassis ground using digital multimeter.
- **Is resistance less than 5 ohms?**

→ **Yes**
GO to **K5** .

→ **No**
REPAIR ground Circuit 398 (BK/Y) or 57 (BK). VERIFY tachometer operation.

K5 CHECK INSTRUMENT CLUSTER PRINTED CIRCUIT

- Visually inspect instrument cluster printed circuit
- **Is printed circuit OK?**

→ **Yes**
REPLACE Tachometer REFER to Removal and Installation portion of this section. VERIFY tachometer operation.

→ **No**
REPLACE printed circuit. REFER to Removal and Installation portion of this section. VERIFY tachometer operation.

PINPOINT TEST L: TACHOMETER NOT REFLECTING ENGINE SPEED

L1 CHECK SUPPLY TO GAUGE

- Turn ignition switch to OFF position.
- Partially remove instrument cluster panel, as outlined, to gain access to the cluster connectors.
- Turn ignition switch to the RUN position.
- Using a voltmeter check voltage at Circuit 640 (R/Y) at connector.
- **Is battery voltage present?**

→ **Yes**
GO to **L2** .

→ **No**
SERVICE Circuit 640 (R/Y) for open. RESTORE vehicle. RETEST system.

L2 CHECK GAUGE GROUND

- Using an ohmmeter connected to a known good ground, connect second lead to Circuit 398 (BK/Y) (except Ranger 2.3L) and Circuit 570 (BK/W).

- Measure resistances.
- **Are resistances 5 ohms or less?**

→ **Yes**
GO to L3 .

→ **No**
SERVICE Circuit 398 (BK/Y) and 570 (BK/W) for open. RESTORE vehicle. RETEST system.

L3 CHECK TACHOMETER INPUT CIRCUIT

- Turn ignition switch to OFF position.
- Disconnect cluster Connector C1.
- Disconnect ignition coil, or DIS.
- Using an ohmmeter, measure resistance of Circuit 11 (T/Y) from ignition coil Connector or DIS Connector to cluster C1 Connector.
- **Is resistance 1.8 ohms or less?**

→ **Yes**
GO to L4 .

→ **No**
SERVICE Circuit 11 (T/Y) for open. RESTORE vehicle. RETEST system.

L4 CHECK CLUSTER CLIP TO CLUSTER CIRCUIT CONNECTION

- Reconnect cluster Connector C1.
- Using an ohmmeter check for continuity from the tachometer connector clips to instrument cluster printed circuit.
- **Is there continuity?**

→ **Yes**
GO to L5 .

→ **No**
REPLACE connector clips. RESTORE vehicle. RETEST system.

L5 CHECK PRINTED CIRCUIT

- Using an ohmmeter, check each circuit listed below for continuity from gauge connector clips to cluster Connector J1.

Pin	Circuit	Function
1	398 (BK/Y)	Ground
4	640 (R/Y)	Run/Start Power
2	11 (T/Y)	Tachometer Input

- **Is there continuity at all circuits?**

→ **Yes**
REPLACE speedometer/tachometer assembly. RESTORE vehicle. RETEST system.

→ **No**
REPLACE instrument cluster printed circuit. RESTORE vehicle. RETEST system.

PINPOINT TEST M: ALL WARNING INDICATORS INOPERATIVE

M1 CHECK CLUSTER GROUND

- Turn ignition switch to OFF position.
- Partially remove instrument cluster as outlined.
- Using an ohmmeter connected to a known good ground, connect second lead to Circuit 57 (BK) at Connector C1, Pins 8 and 10.

- Measure resistance.
- **Is resistance 5 ohms or less?**

→ **Yes**
GO to **M2** .

→ **No**
SERVICE Circuit 57 (BK) for open. RESTORE vehicle. RETEST system.

M2 CHECK SUPPLY AT CLUSTER

- Turn ignition switch to RUN position.
- Using a test lamp check CIrcuit 640 (R/Y) at Connector C1.
- **Did test lamp illuminate?**

→ **Yes**
REPLACE instrument cluster printed circuit. RESTORE vehicle. RETEST system.

→ **No**
SERVICE Circuit 640 (R/Y) for open. RESTORE vehicle. RETEST system.